`

EFFECTIVENESS OF TYRE CHIPS AS ALTERNATIVE MATERIAL IN INCLINED GABION WALL TO MITIGATE SLOPE FAILURE

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I/We* hereby declare that I/We* have checked this thesis/project* and in my/our* opinion, this thesis/project* is adequate in terms of scope and quality for the award of the Bachelor Degree of Civil Engineering.

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I hereby declare that the work in this thesis is based on my original work except for quotations and citations which have been duly acknowledged. I also declare that it has not been previously or concurrently submitted for any other degree at Universiti Malaysia Pahang or any other institutions.

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ABSTRAK

Kegagalan cerun adalah masalah biasa di negara-negara tropika seperti Malaysia, yang dipengaruhi oleh geografi tropika, profil cuaca dan kelembapan udara. Faktor utama kegagalan cerun adalah disebabkan oleh hujan lebat kerana lazimnya kegagalan cerun sering berlaku selepas hujan lebat. Tembok penahan adalah struktur yang dapat mengekalkan tanah di belakangnya dari menggeser atau mengikis. Jenis dinding penahan yang paling mudah ialah dinding gabion. Dinding gabion adalah dinding yang terbuat dari jaring dawai yang disusun diikat bersama dan diisi dengan kelikir. Walau bagaimanapun, penggunaan batu kelikir dalam tembok gabion perlu dikurangkan kerana penggalian batu kelikir berbahaya kepada persekitaran. Oleh itu, penyelesaian untuk mengurangkan penggunaan kelikir di tembok gabion adalah dengan menggabungkan kelikir dengan bahan lain. Tayar terpakai adalah bahan sesuai untuk digabungkan dengan kelikir bagi mengisi dinding gabion dengan nisbah peratusan tertentu. Dalam kajian ini, model cerun akan diuji dengan beberapa nisbah kelikir bercampur cip tayar yang akan diisi ke dinding gabion bagi menahan cerun pasir bersudut 60 ° yang di simulasi hujan buatan berintensiti 570mm/h. Dari hasil kajian, 50% Kelikir dicampur dengan 50% cip tayar sebagai bahan ganti untuk dinding gabion mampu menahan bagi mencegah kegagalan cerun bagi model berskala kecil kerana dari hasil kajian, berbezaan pergerakan dinding gabion 50% Kerikil dicampur 50% cip tayar dengan 100% kerikil hanya 6%.

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ABSTRACT

Slope failure is a common problem in tropical countries such as Malaysia, which is characterised by tropical region, weathering profile and a humid. The main factor of slope failure is cause by heavy rain because normally slides often occur after intense rainfall. A retaining wall is a structure that can retained soil behind it from sliding or eroded away. The most convenient type of retaining wall is gabion wall. A gabion wall is walls made of stacked wire meshes tied together and filled with gravel. However, the use of gravel in gabion needs to be decrease because the gravel quarrying is harmful to the environment .Thus; the solution to decrease usage of gravel in gabion wall is by combine the gravel with other material. Used tyres were chosen to combine with gravel that will fill up the gabion wall with certain percentage ratio. In this study by using slope model and simulation several of ratios that filled up in to gabion wall are tested against the sand slope with 60° angle that subjected artificial rainfall with intensity 570mm/h. From the result of the study, 50% Gravel mixed with 50% tyre chip as material for gabion wall is strength enough to prevent slope failure and provide support for vertical or near-vertical grade for small-scale model because the different between current practices by using 100% gravel is only 6%

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LIST OF SYMBOLS

γ_d	Dry Density
γ	Bulk Density
ω	Water Content
c_u	Coefficient of Uniformity
c_c	Coefficient of Gradation
G_s	Specific Gravity
%	Percentage

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LIST OF ABBREVIATIONS

NEM	North West Monsoon
SWM	South West Monsoon
OLR	Outgoing Longwave Radiation
PWD	Public Works Department
EPA	Environmental Protection Agency
WBCSD	The World Business Council for Sustainable Development

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CHAPTER 1

INTRODUCTION

1.1 Background of Study

Slope failure is a common problem in tropical countries such as Malaysia, which is characterised by tropical region, weathering profile and a humid. The main factor of slope failure is cause by heavy rain because normally slides often occur after intense rainfall. A few months ago, heavy rains over the past few days triggered a landslide on the Cameron Highlands-Sungai Koyan road at 2.30pm on Febuary 2018 but no loss of life or injury was reported, and that no vehicles were involved in the incident. Eventhogh no loss of life or injury the government need to spend lots of money to restore the damages. So, slope stability very important to decrease risk of injury and damages restoring cost Aside from assessing and monitoring existing slopes, whether man-made or natural, another important consideration when it comes to slope stability is proper slope design. Successful slope design requires the gathering of information regarding the site's geology and characteristics (e.g. the properties and status of rock mass, soil, and groundwater in and around the excavation), interpretation of this information, and the development a design that takes this information into account.. For this study, gabion types of retaining wall will be used. Gabion by definition is a cage filled with rocks, concrete, or sometimes sand and soil. A gabion wall is a retaining wall made of stacked stone-filled gabions tied together with wire. Gabion walls are usually angled back towards the slope, or stepped back with the slope, rather than stacked vertically. For this study, instead of stones only, a mixture of tyre chips and stones will be use to fill the gabion wall.

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Figure 1.1 Landslide at the Cameron Highlands-Sungai Koyan road

Source: m.thestar.com.my/

Figure 1.2 Landslide at the Cameron Highlands-Sungai Koyan road

Source: www.nst.com.my

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1.2 Problem Statement

Slope failure is a common phenomenon in tropical countries such as Malaysia, which is characterised by tropical region, weathering profile and a humid. The main factor of slope failure is cause by heavy rain because normally slides often occur after intense rainfall. This is because water is commonly the primary factor triggering a landslide. When storm water runoff saturates soils on steep slopes or when infiltration causes a rapid rise in ground water some slopes become unstable and fail. In addition, slope failure also due to uncontrolled development especially at hilly geographic area such as Cameron Highlands, Ulu Klang, and Serendah. The landslide tragedies have killed many people and also destroy the facilities such as buildings, roads, houses, bridges and others. This phenomenal also enforce the government to spend lots of money to restore the damages. As a result, preventing and reducing landslide effect can be solved by using retaining wall.

A retaining wall is a structure that can holds soil behind it from sliding or eroded away. There are many type of retaining wall structure. The most convenient type of retaining wall is gabion wall. A gabion wall is walls made of stacked wire mesh tied together and fill with gravel. To protect the all hill that has probability to fail around Malaysia, a lot of gravel required to fill up in gabion wall. However, application gravel in gabion needs to be decrease because the gravel quarrying is harmful to environment. For example, gravel quarries immediate ecological damage, destroy forest land and take away the habitats of animals. The gravel is typically produced through drilling and blasting the rock to make it smaller for specific uses. Through drilling and blasting rock, it will increase the noise pollution, air pollution, damage the habitat and biodiversity destruction. One of solution to decrease usage of gravel in gabion wall is by combine the gravel with other material.

Nowadays, dumping used tyres represent a serious environmental problem in Malaysia. The study shows that emissions from the burning of tyres are a serious threat to human health. The toxins released from tyre decomposition may cause irritation, respiratory and skin problems. Meanwhile, used tyre also become mosquito breeding places and spread dengue fever brought by Aedes mosquitoes which listed as the most frequent disease in Malaysia recently. Used tyres were chosen to combine with gravel

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